

Patent claims

1. The use of a promoter selected from the group consisting of
  - 5 A) EPSPS promoter
  - B) B gene promoter
  - C) PDS promoter and
  - D) CHRC promoter
- 10 for the expression of genes in plants of the genus Tagetes, with the proviso that genes from plants of the genus Tagetes which are expressed in wild-type plants of the genus Tagetes by the respective promoter are excluded.
- 15 2. The use according to claim 1, wherein expression takes place specifically in flowers.
3. The use according to claim 2, wherein expression takes place specifically in petals.
- 20 4. The use according to one of claims 1 to 3, wherein the EPSPS promoter according to claim 1 comprises
  - A1) the nucleic acid sequence SEQ. ID. NO. 1, 2 or 3 or
  - A2) a sequence derived from these sequences by substitution, insertion or deletion of nucleotides, which has an identity of at least 60% at nucleic acid
  - 25 level with the respective sequence SEQ. ID. NO. 1, 2 or 3 or
  - A3) a nucleic acid sequence which hybridizes with the nucleic acid sequence SEQ. ID. NO. 1, 2 or 3 under stringent conditions or
  - A4) functionally equivalent fragments of the sequences under A1), A2) or A3).
- 30 5. The use according to one of claims 1 to 3, wherein the B gene promoter according to claim 1 comprises
  - B1) the nucleic acid sequence SEQ. ID. NO. 4, 5 or 6 or
  - 35 B2) a sequence derived from these sequences by substitution, insertion or deletion of nucleotides, which has an identity of at least 60% at nucleic acid level with the respective sequence SEQ. ID. NO. 4, 5 or 6 or

B3) a nucleic acid sequence which hybridizes with the nucleic acid sequence SEQ. ID. NO. 4, 5 or 6 under stringent conditions or

B4) functionally equivalent fragments of the sequences under B1), B2) or B3).

- 5 6. The use according to one of claims 1 to 3, wherein the PDS promoter according to claim 1 comprises

C1) the nucleic acid sequence SEQ. ID. NO. 7, 8, 9 or 10 or

10 C2) a sequence derived from these sequences by substitution, insertion or deletion of nucleotides, which has an identity of at least 60% at nucleic acid level with the respective sequence SEQ. ID. NO. 7, 8, 9 or 10 or

C3) a nucleic acid sequence which hybridizes with the nucleic acid sequence SEQ. ID. NO. 7, 8, 9 or 10 under stringent conditions or

15 C4) functionally equivalent fragments of the sequences under C1), C2) or C3).

7. The use according to one of claims 1 to 3, wherein the CHRC promoter according to claim 1 comprises

D1) the nucleic acid sequence SEQ. ID. NO. 11, 12, 13 or 14 or

20 D2) a sequence derived from these sequences by substitution, insertion or deletion of nucleotides, which has an identity of at least 60% at nucleic acid level with the respective sequence SEQ. ID. NO. 11, 12, 13 or 14 or

D3) a nucleic acid sequence which hybridizes with the nucleic acid sequence SEQ. ID. NO. 11, 12, 13 or 14 under stringent conditions or

25 D4) functionally equivalent fragments of the sequences under D1), D2) or D3).

8. A genetically modified plant of the genus *Tagetes*, the genetic modification leading to an increasing or causing of the expression rate of at least one gene in comparison with the wild-type and being due to the regulation of the expression of this  
30 gene in the plant by promoters according to one of claims 1 to 7.

9. The genetically modified plant according to claim 8, wherein the regulation of the expression of genes in the plant is achieved by means of promoters according to one of claims 1 to 7, in that

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- a) one or more promoters according to one of claims 1 to 7 is inserted into the genome of the plant such that the expression of one or more endogenous genes takes place under the control of the inserted promoters ac-

cording to one of claims 1 to 7 or

- 5           b) one or more genes is inserted into the genome of the plant such that the expression of one or more of the inserted genes takes place under the control of the endogenous promoters according to one of claims 1 to 7 or
- c) one or more nucleic acid constructs comprising at least one promoter according to one of claims 1 to 7 and, functionally linked, one or more genes to be expressed are inserted into the plant.

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10. A genetically modified plant of the genus *Tagetes*, comprising a promoter according to one of claims 1 to 7 and, functionally linked, a gene to be expressed, with the proviso that genes from plants of the genus *Tagetes*, which are expressed in wild-type plants of the genus *Tagetes* by the respective promoter, are excluded.

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11. The genetically modified plant according to one of claims 8 to 10, wherein the genes to be expressed are selected from the group consisting of nucleic acids encoding a protein from the biosynthesis pathway of proteinogenic and nonproteinogenic amino acids, nucleic acids encoding a protein from the biosynthesis pathway of nucleotides and nucleosides, nucleic acids encoding a protein from the biosynthesis pathway of organic acids, nucleic acids encoding a protein from the biosynthesis pathway of lipids and fatty acids, nucleic acids encoding a protein from the biosynthesis pathway of diols, nucleic acids encoding a protein from the biosynthesis pathway of carbohydrates, nucleic acids encoding a protein from the biosynthesis pathway of aromatic compound, nucleic acids encoding a protein from the biosynthesis pathway of vitamins, nucleic acids encoding a protein from the biosynthesis pathway of carotenoids, nucleic acids encoding a protein from the biosynthesis pathway of cofactors and nucleic acids encoding a protein from the biosynthesis pathway of enzymes, where the genes, if appropriate, can comprise further regulation elements.

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12. The genetically modified plant according to claim 11, wherein, as genes to be expressed, nucleic acids encoding a protein from the biosynthesis pathway of carotenoids are used.

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13. The genetically modified plant according to claim 12, wherein the genes to be expressed are selected from the group consisting of nucleic acids encoding a ketolase, nucleic acids encoding a  $\beta$ -hydroxylase, nucleic acids encoding a  $\beta$ -cyclase, nucleic acids encoding an  $\epsilon$ -cyclase, nucleic acids encoding an epoxidase, nucleic acids encoding an HMG-CoA reductase, nucleic acids encoding an (E)-4-hydroxy-3-methylbut-2-enyl-diphosphate reductase, nucleic acids encoding a 1-deoxy-D-xylose-5-phosphate synthase, nucleic acids encoding a 1-deoxy-D-xylose-5-phosphate reductoisomerase, nucleic acids encoding an isopentenyl diphosphate  $\Delta$ -isomerase, nucleic acids encoding a geranyl diphosphate synthase, nucleic acids encoding a farnesyl diphosphate synthase, nucleic acids encoding a geranylgeranyl diphosphate synthase, nucleic acids encoding a phytoene synthase, nucleic acids encoding a phytoene desaturase, nucleic acids encoding a prephytoene synthase, nucleic acids encoding a zeta-carotene desaturase, nucleic acids encoding a crtISO protein, nucleic acids encoding an FtsZ protein and nucleic acids encoding a MinD protein.
14. A process for the preparation of biosynthetic products by culturing genetically modified plants of the genus *Tagetes* according to one of claims 8 to 13.
15. A process for the production of carotenoids by culturing genetically modified plants according to one of claims 8 to 13, wherein the genes to be expressed are selected from the group consisting of nucleic acids encoding a ketolase, nucleic acids encoding a  $\beta$ -hydroxylase, nucleic acids encoding a  $\beta$ -cyclase, nucleic acids encoding an  $\epsilon$ -cyclase, nucleic acids encoding an epoxidase, nucleic acids encoding an HMG-CoA reductase, nucleic acids encoding an (E)-4-hydroxy-3-methylbut-2-enyl-diphosphate reductase, nucleic acids encoding a 1-deoxy-D-xylose-5-phosphate synthase, nucleic acids encoding a 1-deoxy-D-xylose-5-phosphate reductoisomerase, nucleic acids encoding an isopentenyl diphosphate  $\Delta$ -isomerase, nucleic acids encoding a geranyl diphosphate synthase, nucleic acids encoding a farnesyl diphosphate synthase, nucleic acids encoding a geranylgeranyl diphosphate synthase, nucleic acids encoding a phytoene synthase, nucleic acids encoding a phytoene desaturase, nucleic acids encoding a prephytoene synthase, nucleic acids encoding a zeta-carotene desaturase, nucleic acids encoding a crtISO protein, nucleic acids encoding an FtsZ protein and nucleic acids encoding a MinD protein.

16. The process according to claim 15, wherein, after culturing, the genetically modified plants are harvested and the carotenoids are subsequently isolated from the genetically modified plants.
- 5 17. The process according to claim 16, wherein the flowers of the genetically modified plants are harvested and the carotenoids are subsequently isolated from the petals of the genetically modified plants.
- 10 18. The process according to one of claims 15 to 17, wherein the carotenoids are selected from the group consisting of phytoene, lycopene, lutein, zeaxanthin, astaxanthin, canthaxanthin, echinenone, 3-hydroxyechinenone, 3'-hydroxyechinenone, adonirubin, violaxanthin and adonixanthin.